

**REMARKS**

This is in response to the Official Action currently outstanding with regard to the above-identified application, which Official Action the Examiner has designated as being FINAL

Claims 1-6 and 8 were pending at the time of the issuance of the currently outstanding FINAL Official Action. The foregoing Amendment proposes that Claims 1, 2 and 8 be amended.. No Claims are proposed to be added, canceled or withdrawn by this Amendment. Accordingly, in the event that the Examiner grants the entry to the foregoing Amendment, Claims 1 -6 and 8 as hereinabove amended will constitute the claims under active consideration in this application.

The claims as they will stand in the event that the Examiner grants the entry to the foregoing Amendment are reproduced above showing the changes proposed to be made and with appropriate status identifiers as required by the Rules.

Specifically, in the currently outstanding non-final Official Action, the Examiner has:

1. Not re-acknowledged Applicants' claim for foreign priority under 35 USC 119 (a)-(d) and (f), and not reconfirmed the receipt of the required copies of the priority documents by the United States Patent and Trademark Office – **Applicants respectfully note that the Examiner acknowledged and confirmed the appropriate completion of these requirements by Applicants in the previous Official Action in the above-identified application.**
2. Not reconfirmed his acceptance of the drawings as filed in this application on 8 February 2006. - **Applicants respectfully note that the Examiner acknowledged and confirmed the appropriate completion of this requirements by Applicants in the previous Official Action in the above-identified application.**

3. Provided Applicants with a Notice of References Cited (Form PTO-892)
4. Not provided Applicants with copies of the Forms PTO/SB/08a/b that accompanied their Information Disclosure Statements filed in the above-identified application duly signed, dated and initialed by the Examiner in confirmation of his consideration of the art listed therein – **Applicants respectfully note that their previous reference to an Information Disclosure Statements filed on or about 19 May 2008 was in error and thank the Examiner for his clarification of this inadvertent error by Applicants in their last response.**
5. Rejected Claims 1-2 under 35 USC §102(b) as being anticipated by Naruse et al (JP No. 01-200965);
6. Rejected Claims 3, 4 and 8 under 35 USC §103(a) as being unpatentable over Naruse et al in view of Kato et al (JP 2002-172786)
7. Indicated that Claims 5 and 6 are allowed.

No further comment regarding items 1-4 and 7 above is deemed to be required in these Remarks.

With respect to items 5 and 6 above, Applicants by the foregoing Amendment have amended Claims 1 and 2 so as to more clearly indicate that “the electrode section” and “the driving electrode” in those claims are intended to refer to the same component/element. In addition, Claim 8 has been amended so as to clarify that the nozzle as claimed has a tapered shape.

With respect to the rejections of Claims 1-4, therefore, Applicants have to following comments that are deemed to clearly and distinctly show the patentability of those claims over that art being relied upon by the Examiner.

A feature of Claims 1 and 3 is that “in the electrostatic suction type fluid discharge device having a micro diameter of 0.01 – 25  $\mu\text{m}$ , a drive frequency that allows discharge is improved, enabling selections of discharge fluid materials with higher resistance”.

In the latter regard, it will be understood that a conventional electrostatic suction type fluid discharge device includes a drive electrode inside a nozzle thereof. Consequently, the discharge characteristics thereof are determined with a dependence on the electrical resistance in a flow path for the discharge fluid that extends from the drive electrode to the tip of the nozzle in a fluid discharge head. More specifically, the lower the electrical resistance is, the better the discharge response becomes.

In contrast to the foregoing, however, in the case of the electrostatic suction type discharge device of the present invention, in a fluid discharge head employing a nozzle with a micro diameter of 0.01  $\mu\text{m}$  to 25  $\mu\text{m}$ , it is difficult to dispose the drive electrode in the fluid flow path closer to the nozzle hole as the diameter of the nozzle decreases. More specifically, it becomes structurally difficult to coat an inner wall of the ink flow path with an electrode up to the vicinity of the nozzle, or to insert an electrode line into the ink flow path up to the vicinity of the nozzle.

In order to solve this problem, the electrostatic suction type fluid discharge device of the present invention is configured such that an external wall of the nozzle is coated with a conductive material and a drive voltage is applied to the tip of the nozzle. This is to say that an electric charge is supplied to the discharge fluid at the tip of the nozzle, thereby improving the discharge characteristics of the fluid discharge head employing a nozzle having a micro diameter.

In contrast to the foregoing, however, the Naruse reference describes a configuration in which a projection is provided around a nozzle and a conductive electrode is provided on the surface of the projection and inside the projection. Accordingly, it will be seen that the Naruse reference does not describe that a nozzle has a micro diameter of 0.01  $\mu\text{m}$  to 25  $\mu\text{m}$ , and is not intended for accomplishing an improvement in a discharge response. More particularly, Naruse describes subjecting the surface of the projection to a conductive material process so as to prevent the front face of the electrode from being covered with ink, thereby increasing an ink discharge force (allowing discharging of ink with smaller voltage application and increasing jet efficiency) and improving jet positional accuracy (see page 3, upper left hand column of the Naruse reference).

As described above, therefore, although the Naruse reference describes the provision of a conductive electrode on the surface of the projection and inside the projection, the technical idea of the Naruse reference seems to be such that an electrode is provided inside a nozzle so as to improve jet efficiency (so as to efficiently supply an electric charge to ink in the nozzle), thereby increasing an area where the electrode and the ink contact each other. In contrast, the present invention is intended for increasing a discharge response of the ink. Consequently, the present invention has the technical idea that the electrode is provided on the exterior surface of the nozzle so that a nozzle hole and an electrical section can be made to correspond to each other. Hence, Applicants respectfully submit that the Naruse reference and the present invention clearly and definitely evidence entirely different technical ideas.

Furthermore, the Kato reference describes an electrostatic inkjet head whose nozzle has a tip opening ranging from 5 – 120  $\mu\text{m}$ . The Examiner is correct to the extent that this range partially overlaps the range of the diameter of the nozzle of the present invention. However, Applicants respectfully submit that the Kato reference is characterized by a driving method for increasing the speed of moving ink, and does not describe providing an electrode on an exterior surface of a nozzle so that a nozzle hole and an electrode section are closer to each other in order to increase the discharge response of the ink.

Still further, the electrostatic suction fluid discharge device having a nozzle of micro diameter is such as to tend to have a lower response characteristic of the ink as a discharge material has higher resistance. In the present invention, this response characteristic is improved, enabling selections of discharge materials having higher resistance. Neither the Naruse reference nor the Kato reference teach, disclose or suggest discharging materials having higher resistances.

In summary, therefore, Applicants respectfully submit that the configuration of the Naruse reference in which the conductive electrode is provided on the surface of the projection is designed with an entirely different technical idea from that of the present invention, and a person of ordinary skill in the art at the time that the present invention was made could not easily have arrived at the present invention based upon a consideration of the Naruse reference in view of the Kato reference.

Similarly, with respect to Claim 8, Applicants have the following comments that are deemed to clearly and distinctly show that contrary to the Examiner's stated position in the currently outstanding Official Action the patentability of that claim over the art being relied upon by the Examiner has not been shown upon the present record.

In the field to which the present invention pertains, it is generally considered that it is difficult to form a micro nozzle as defined in the present claims of the above-identified application. Indeed, a micro nozzle whose diameter is smaller than the minimum diameter(5  $\mu\text{m}$ ) mentioned in the cited Kato reference is commonly thought in the art as disclosed representatively in the Naruse and Kato references to be very difficult to form.

In this regard, Claim 8 of the present application defines that the nozzle is to be formed by a method suitable for forming a nozzle having an internal diameter of 0.01  $\mu\text{m}$  to 5  $\mu\text{m}$ , i.e., a method of deforming a glass tube having high formability by heat and applied stretching forces. As a result of that deformation, the nozzle is to have a tapered shape, which raises another problem not dealt with by the art relied upon by the Examiner in that it is structurally difficult to insert an electrode line into such a small diameter, tapered lumen of a nozzle. Thus, *Kato describes at paragraph [0007] that it is possible to use glass as a material for the inner wall of a nozzle. However, Kato does not describe that “nozzle has a tapered shape” as now herein specifically claimed assuming that the Examiner enters the foregoing Amendment.*

Consequently, Applicants also respectfully submit that one of ordinary skill in the art at the time that the present invention was made could not have easily conceived, much less made, the present invention based upon the combination of the Naruse and Kato references upon which the Examiner now relies in rejecting the claims of the above-identified application.

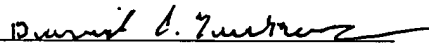
Therefore, it is believed that the claims of this application as they will stand in the event that the Examiner grants the entry of the foregoing Amendment are patentable, and Applicants consequently respectfully request the entry of the foregoing Amendment, reconsideration and allowance of this application in response to this submission.

Shigeru Nishio, et al  
USSN: 10/567,874  
Page 12

Applicant believes that additional fees beyond those submitted herewith are not required in connection with the consideration of this response to the currently outstanding Official Action. However, if for any reason a fee is required, a fee paid is inadequate or credit is owed for any excess fee paid, you are hereby authorized and requested to charge and/or credit Deposit Account No. **04-1105**, as necessary, for the correct payment of all fees which may be due in connection with the filing and consideration of this communication.

Respectfully submitted,

Date: April 24, 2009

  
SIGNATURE OF PRACTITIONER

Reg. No.:27,840

David A. Tucker  
(Type or print name of practitioner)  
Attorney for Applicant(s)

Tel. No. (617) 517-5508

Edwards Angell Palmer & Dodge LLP  
P.O. Box 55874  
P.O. Address

Customer No.: 21874

Boston, MA 02205